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Fritziana ulei (Miranda-Ribeiro, 1926): geographic extension, with comments on the natural history of this species

Rafael Costabile Menegucci[1,2,4], **Renato Gaiga**[3] & **Ibere Farina Machado**[2]

[1] Universidade Federal de Alfenas, Rua Gabriel Monteiro da Silva, 700, Centro, CEP 37130-000, Alfenas, MG, Brazil
[2] Instituto Boitatá, Avenida 136, Qd. F-44, lojas 01 e 02 Setor Sul, CEP 74093-250, Goiânia, GO, Brazil
[3] Biotropica Consultoria Ambiental Ltda, Av. Santo Antônio, n 571, Jd Cascatinha, CEP 37701-036, Poços de Caldas, MG, Brazil
[4] Corresponding author: Email: rafael__menegucci@hotmail.com

Abstract: We report new records of *Fritziana ulei* (Miranda-Ribeiro, 1926) from Rio de Janeiro and São Paulo states, Brazil, extending the geographic distribution of this species south from its previously known range. The new records are from areas of marshland in the Atlantic Forest biome and are about 480 m lower in altitude than all previously known occurrences.

Key words: new records; marsupial frog; egg-brooding frog; Atlantic Forest; Anura; Hemiphractidae; Dacnis Project

The family Hemiphractidae is composed of six genera and endemic to the Neotropical Region, being distributed from Costa Rica and Panama, south through northern (excluding Surinam) and western South American to northern Argentina and eastern and southeastern Brazil (Frost 2016). The genus *Fritziana* Mello-Leitão, 1937 is endemic of the Atlantic Rainforest (Folly et al. 2014) where it is occurs in the lowlands and on slopes of the coastal mountains to elevations of 2200 m in southeastern Brazil (Duellman 2015). It is composed by five species, *F. goeldii* (Boulenger, 1895), *F. ohausi* (Wandolleck, 1907), *F. fissilis* (Miranda-Ribeiro, 1920), *F. tonimi* Walker, Gasparini & Haddad, 2016, and *F. ulei* (Miranda-Ribeiro, 1926) (Castroviejo-Fisher et al. 2015). *Fritziana* spp. are commonly known as egg-brooding frogs or marsupial frogs due to their peculiar reproductive specialization, where females carry their embryos on back, protected in some species by a thin membrane, before laying their endotrophic tadpoles in bromeliads or bamboos (Haddad et al. 2005).

Fritziana ulei was recently removed from synonymy of *F. fissilis* after being neglected for 48 years (Bokermann 1966; Frost 2016; Folly et al. 2014). *Fritziana ulei* is poorly represented in scientific collections and its redescription was based on two female and three male specimens (Folly et al. 2014). The species was only known from five locations: Resende, Lumiar, and Nova Friburgo in the state of Rio de Janeiro, and São José do Barreiro and Ubatuba in the state of São Paulo. Each voucher specimen from Ubatuba (MZUSP A-75903, A-75844, A-128089) was collected from Campo de Fruticultura da Serra da Bocaina, currently part of the Parque Nacional da Serra da Bocaina (Folly, pers. comm.). All were obtained at high altitudes between 500–2200 m above sea level (Folly et al. 2014). Here, we document new records of *F. ulei* from near sea level in the states of São Paulo and Rio de Janeiro. We also comment on some aspects of the natural history of this species.

We recorded individuals of *F. ulei* in the municipality of Ubatuba, São Paulo, at two new locations (Figure 1). Fieldwork and collections were done under SISBIO license 48636-2. At Angelim Rainforest Farm (23°23′30.34″ S, 045°03′42.87″ W, 77 m above sea level) we record two females. One of these females was deposited as a voucher in the Coleção "Célio F. B. Haddad", Universidade Estadual Paulista (CCFBH 40020). Two males (one of them deposited, CCFBH 35964) were recorded in municipality of Paraty (Figure 1), state of Rio de Janeiro (23°10′35.84″ S, 044°49′52.30″ W, 1360 m above sea level). These males were vocalizing in a bromeliad that was 250 cm above the ground. Other males were heard calling in bromeliads in the canopy (Figure 2) during December 2013. In the Dacnis Project (23°27′25.74″ S, 045°08′46.56″ W, 30 m above sea level), a single female was found in August 2015 (Figure 3). It was close to its reproductive period, as evidenced by the thin skin on the side of its body and the presence of eggs. Other females with embryos on their back were found on December 2015 and January 2016; these three females were carrying eight embryos each. Also in the Dacnis Project, two females were found 150 cm above the ground on bushes and two on 160 cm above the ground on small (diameter < 45 cm) bromeliads.

Specimens of *F. ulei* from the municipalities of Ubatuba and Paraty were identified and compared to the description of of *F. tonimi* Walker et al. (2016) because they had the color pattern described by Folly et al. (2014). New studies

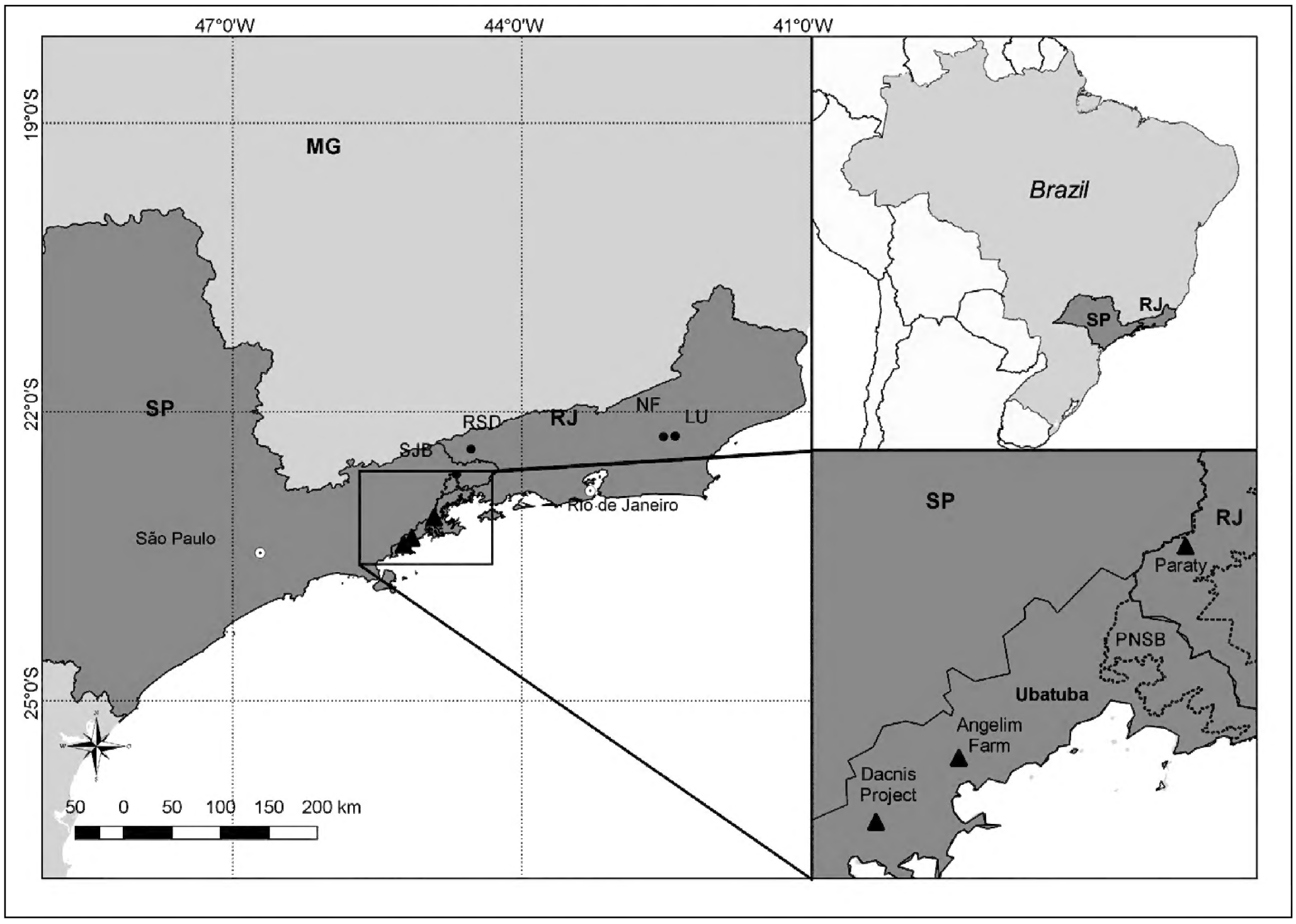

Figure 1. Map of distribution of known localities for *Fritziana ulei* based on the new and literature records. Black dots are previous records: Resende (RSD), Lumiar (LU), and Nova Friburgo (NF) in Rio de Janeiro state; São José do Barreiro (SJB) in São Paulo state. Black triangles are the new records at Angelim Farm (Ubatuba, São Paulo) and Dacnis Project (Paraty, Rio de Janeiro).

underway to identify whether color variations are sex-biased, new species, or polychromatic specimens (as known for *F. tonimi*; Walker et al. 2016). However, our individuals show a remarkable variation in color, including uniform color pattern (Figure 4), bronze coloring only at the tip of the nostril or around the nostrils, above the eyes, on the forearms and on the heels (Figure 5–8). Although we found that color patterns varied, our specimens (Figure 4–8) had an interorbital bronze pentagon- or hexagon-shaped mark bordered by black, normally shaped subarticular and supernumerary tubercles, uniformly beige venter. The diameter of the tympanum is also less than the width of the disc on the third finger, and together with the color, conforms to the redescription of *F. ulei* (Folly et al. 2014). *Fritziana fissilis* and *F. goeldii* occurring in the area present different color patterns (Figures 9, 10).

The known distribution of *F. ulei* were made on the inner slopes of Serra do Mar (Folley et al. 2014), whereas our new records were made on coastal lowlands. The Angelim Rainforest Farm in Ubatuba is located 110 km south of the nearest previously known occurrence, 290 km from the northernmost record, and at least 480 m lower in altitude than all previous records. The new records add to this species' extent of occurrence, essential for assessing conservation status (IUCN 2001). *Fritziana ulei* was reinstated as a valid species after a 2014 publication on the conservation status of all Brazilian amphibian species (Brazil 2014), and therefore, it has not received due attention. Our data show that the extent of occurrence is about 11,000 km^2 (measured by a minimum convex polygon) but this is in the Atlantic Forest, which is the most imperiled biome in Brazil. Only about 15% of the original forest cover remains (SOS Mata Atlantica & INPE 2016). Although *F. ulei* has a relatively small range, the species remains insufficiently known to warrant an IUCN Red List category. More is known about the genus *Fritziana* each year with newly described species and a better understanding of species' distributions and ecology. Our new data adds to this knowledge but also especially adds to what is known about *F. ulei*.

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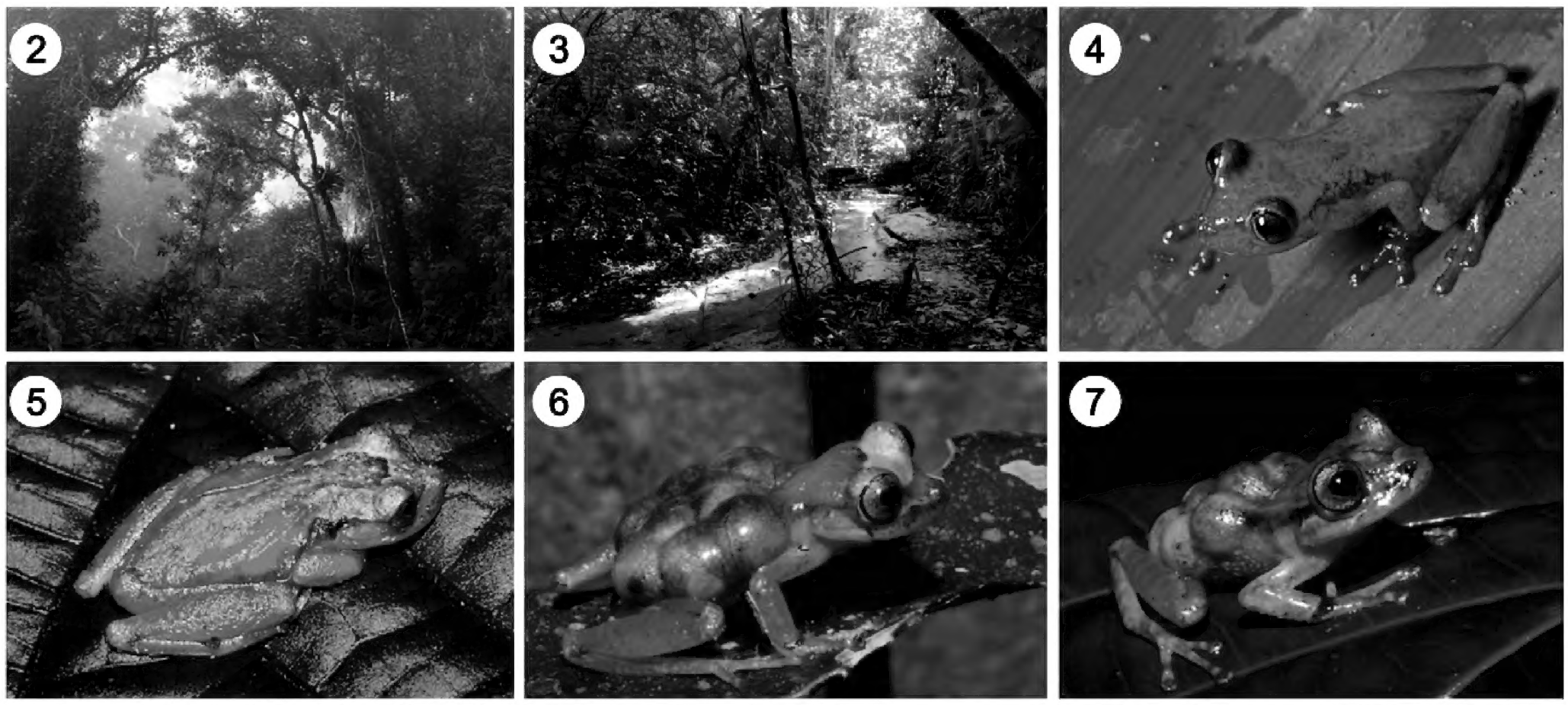

Figures 2–8. Specimens of *Fritziana ulei* and vocalization site record in present study. **2.** Vocalization site in Atlantic Forest, Paraty, Rio de Janeiro. **3.** Vocalization site in Atlantic Forest, Ubatuba, São Paulo. **4.** Male with uniform color pattern (voucher CCFBH 35964) from Paraty, Rio de Janeiro. **5.** Female with bronze color around the nostrils, above the eyes, on the forearms, and on the heels, from the Dacnis Project, Ubatuba, São Paulo. **6.** Female from Angelim Rain Forest Farm, Ubatuba, São Paulo. **7.** Female with bronze only on the tip of the nostril, from the Dacnis Project, Ubatuba, São Paulo. **8.** Typically colored female from Angelim Rainforest Farm (voucher CCFBH 40020), Ubatuba, São Paulo. **9.** Female of *Fritziana fissilis* from the Dacnis Project, Ubatuba, São Paulo. **10.** Female of *Fritziana goeldii* from the Dacnis Project, Ubatuba, São Paulo (photo by Edélcio Muscat, used with permission).

information, and Edélcio Muscat for use of his photo of *F. goeldii* (Figure 10). We also thank Unifal and the Institute Boitatá for the partnership through the Amplexus Project. Finally, we thank the anonymous reviewers for critically reading and improving our manuscript.

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